METHOD AND SYSTEM FOR PREVENTING VEHICLE MISFUELLING

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BACKGROUND OF THE INVENTION

The present invention relates to a method and system of preventing the addition of the wrong type of fuel to a fuel tank, by monitoring the vapor pressure of the fuel being added, and if detected as the incorrect fuel, shutting off the supply by activating the fuel pump's shutoff via maintaining a vacuum on the fuel nozzle or by inducing increased back pressure in the fuel tank.

Because of differing types of fuel being offered at filling stations, it is frequent that the wrong type of fuel will be added to a vehicle's tank. Particularly troublesome is the confusion between diesel and gasoline fuels, which because of their chemical properties, are not interchangeable. Furthermore, the addition of the wrong type of fuel will not only fail to power the vehicle, but also exposes the engine to the possibility of serious damage.

Various methods have been implemented to prevent the confusion of the fuels, including the manufacture of diesel fuel nozzles and filler necks being a larger diameter than their gasoline counterparts. This works relatively well for automotive use, since the fuel aperture in gasoline-powered cars are intentionally narrower as to prevent the introduction of a diesel nozzle into the filler neck. However, the converse is not true. Diesel filler necks readily accept the smaller gasoline filler nozzle, and so without proper attention, large amounts of money can be lost on an

oversight when the wrong fuel is added to an engine and causes is to malfunction, or in some cases, to injure those who may be in the proximity.

The present invention alleviates this problem by effectively preventing the addition of any type of fuel that can be identified by vapor pressure from being added to a properly equipped fuel tank. Additionally, having such a device capable of being retrofitted to current vehicles enables end users to equip their own vehicles, rather than relying upon filling stations to retrofit their pumps with a similar system.

OBJECTS AND SUMMARY OF THE INVENTION

One objective of this invention is to provide a device that identifies a fuel by a predetermined physical or chemical characteristic and then selectively maintain a vacuum and/or controls a valve to prevent the addition of an undesired fuel to a fuel tank.

Another objective of this invention is to identify a fuel by a predetermined physical or chemical characteristic, and to increase the back pressure in a fuel tank to engage the fuel pump's internal shut-off if the fuel being added does not match the specified fuel to be added to the tank.

Still another objective of this invention is to fill a long felt need in the art for such devices, since as far as is known, there is no such device or method for automatically preventing the addition of incorrect fuel based on a receiving-side monitoring system.

Still another objective of the invention is to provide a method to prevent the addition of any fuel not matching the appropriate predetermined physical or

chemical characteristic by applying a vacuum to a fuel nozzle or increasing back pressure inside the fuel tank, thus engaging the fuel pump's automatic shut-off.

Other objects and advantages of this invention shall become apparent from the ensuing descriptions of the invention.

According to the present invention, the apparatus receives a fuel nozzle into the filler neck, and activates a vacuum on the nozzle inserted therein. Using the pump's internal shut-off mechanism, this prevents the fuel pump from dispensing fuel until the sensing unit within the apparatus is able to identify the fuel proposed to be added to the tank. If the fuel is deemed acceptable, the vacuum is released, and the fuel is permitted to enter into the desired fuel tank.

DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate a preferred embodiment of this invention. However, it is to be understood that this embodiment is intended to be neither exhaustive, nor limiting of the invention. They are but examples of some of the forms in which the invention may be practiced.

FIG. **1A** shows cutaway view of the fuel detection assembly.

FIG. **1B** shows a front view of the valve screen in FIG **1A**.

FIG. **2** shows a landscape view of a vehicle being fuelled.

FIG. **3** shows a front view of the control panel and switches for the detection unit.

FIG. **4** shows a cutaway view of an alternate embodiment of the fuel detection assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Without any intent to limit the scope of this invention, reference is made to the figures in describing the preferred embodiments of the invention. Referring to FIGS. **1** and **2**, apparatus **300** is used to sense the type of fuel being added to fuel tank **106**. Fuel tank **106** can be one of many types, such as that of a motor vehicle, aircraft, spacecraft, watercraft, free standing tank or any other vessel used to store fuel. Fuel **105** can be gasoline, diesel, aviation fuel, rocket fuel, or any other type of fuel. Apparatus **300** comprises filler neck **302**, where most of the device's components are located. Within filler neck **302** is chamber **304**, forming cavity **308** between filler neck **302** and chamber **304**. At one end of chamber **304** is valve **303** which can prevent any fuel **105** or liquid from entering fuel tank **106** when closed. The valve **303** can be operated by any number of devices, such as solenoid **312**. A short distance toward the inside of chamber **304** beyond valve **303** is valve screen **307**, shown in greater detail in FIG. **1B**. At the opposite end of chamber **304** is the fuel nozzle aperture **305**, which contains door **313**, on which is mounted switch **314**. A short distance down chamber **304** from fuel nozzle aperture **305** is gasket **306**. There is also fluid passageway **309** which connects chamber **304** to cavity **308**. Within fluid passageway **309** is sensing unit **310** and vacuum pump **311**.

Sensing unit **310** can be any type of sensor, detector, catalyst or the like, which could be used to identify fuel **105** and relay data used to operate apparatus **300**. A commercially available example of one such sensor is the Figaro TGS 813, which is capable of measuring fuel **105** vapor pressure. Another example is the

Delphian Catalytic Bead Sensor, which can be employed to detect the upper or lower explosion limits of fuel **105** by measuring the exothermic energy produced by fuel **105** when it comes in contact with a catalyst. Further examples of possible sensors are infrared detectors which identify fuel **105** by passing infrared light through fuel **105**, or various catalytic reactions that permit the identification of fuels.

Referring to FIG. **3**, an alarm unit **401** can also be employed in conjunction with apparatus **300**. Alarm unit **401** can be connected to sensing unit **310**, vacuum pump **311**, solenoid **312**, and valve **303**, depending on the selected configuration. Alarm unit **401** can have various indicators and/or alarms, such as an operating indicator **402**, alarm indicator **403**, reset switch **404**, test switch **405** and audible alarm **406**.

In operation, fuel nozzle **111** is inserted into fuel nozzle aperture **305** opening door **313** and is inserted into gasket **306**, which creates a seal around fuel nozzle **111**. Once door **313** is opened, switch **314** activates vacuum pump **311** and closes valve **303**. The seal created by gasket **306** and valve **303** encloses chamber **304** and when vacuum pump **311** is turned on, a vacuum is created within chamber **304**. Generally, fuel pumps **112** are configured to shut off automatically once fuel tank **106** is full, by detecting when fuel **105** covers detection hole **113** on fuel nozzle **111**. Once this occurs, fuel pump **112** ceases dispensing fuel **105**. Using this concept, the vacuum created in chamber **304** achieves the same result as fuel **105** covering detection hole **113**, and thus causes fuel pump **112** to shut off in a similar fashion.

Once fuel nozzle **111** is inserted into chamber **304**, sensing unit **310** will be able to detect the type of fuel **105** that is being dispensed, and make a logical determination whether to open valve **303** and turn off vacuum pump **311**, thus permitting fuel **105** to enter fuel tank **106**. Alternately, sensing unit **310** can make the determination that fuel **105** is inappropriate, and leave valve **303** closed and keep vacuum pump **311** on to prevent any fuel from entering fuel tank **106**. Audible alarm **406** can also be activated with alarm indicator **403** if so configured to indicate to the user that fuel **105** is incorrect.

Referring to FIG. **4**, another embodiment, there is apparatus **100** for sensing the type of fuel being added to a fuel tank is illustrated comprising vent tube **101** which runs from the atmosphere to fuel tank **106**. Vent tube **101** also has valve **102** integrated with it whose open or closed position can be controlled by actuator **103**. Actuator **103** is connected or otherwise maintains communication with sensing unit **104** which can be used to measure the vapor pressure of fuel **105** being added to fuel tank **106**. Actuator can be any device capable of adjusting the position of valve **102**, such as solenoid **312**.

Additional components can be added to increase the efficiency of apparatus **100**, such as surge protector **108**, which aid in preventing splashing back of fuel **105** onto sensing unit **104**. Alternately, or in combination, deflector **114** can also be used for this task.

As indicated above, referring to FIG. **3**, an alarm unit **401** can also be employed in conjunction with apparatus **100**.

In operation, filler nozzle **111** is inserted into filler neck **110** in order to fill fuel tank **106**. As fuel **105** is being dispensed, sensing unit **104** detects the identity of fuel **105** and determines if it is the proper fuel to be added to fuel tank **106**. If it is determined to be the correct fuel, no action is taken. If, however, the fuel is determined to be the wrong fuel, sensing unit **104** will either directly or through any type of logical control, close valve **102**. This can be accomplished using the aforementioned solenoid **107**. Once valve **102** is closed, vent tube **101** is no longer vented to the atmosphere, and vapor pressure within fuel tank **106** increases rapidly, which activates the fuel pump's **112** internal shut off mechanism. This mechanism is already in place in most fuel pumps **112**, as this measurement of vapor pressure is what indicates the fuel tank is full. In the present invention, fuel pump **112** is "tricked" into believing fuel tank **106** is full, thereby cutting off fuel **105** flow.

Although only a few exemplary embodiments of this invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the following claims.